

ABSTRACT

A two-color photo-detector capable of sensing two colors at a single photo-detector location is provided having a lower photo-detector element resident in the bulk silicon and an upper photo-detector element elevated above the lower photo-detector element. The color sensitivity of each of the photo-detector elements is determined according to the absorption curve of the upper photo-detector element, the thickness of the upper photo-detector element and the color filter array, if any. The elevated upper photo-detector element overlies the circuitry needed for both the upper photo-detector element and the lower photo-detector element. In order to accurately sample color within an array of two-color photo-detectors without a color filter array, two different thicknesses for the upper photo-detector elements of adjacent two-color photo-detectors are used. Therefore, each pair of two-color photo-detectors within the array senses four different colors (i.e., blue and the complement of blue and red and the complement of red). To process the raw color values for compression and storage, a simple color-conversion matrix can be used on a 2x2 block of two-color photo-detectors to convert the four colors (eight color values) to a new color space, such as YCbCr (4:1:1), without traditional demosaicing neighborhood operations.